

Application No. 09/769,915
Amendment dated October 9, 2003, 2003
Reply to Office Action of July 10, 2003

Claims 17-28 are hereby submitted for review and consideration.

No new matter has been added.

In the Office Action, the Examiner has noted that if claim 17 is found allowable, claim 25 will be rejected as a substantial duplicate thereof. Additionally, the Examiner has rejected claims 17, 18-21, 25 and 26 under 35 U.S.C. § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Finally, the Examiner has rejected claims 17-23 and 25-28 under 35 U.S.C. § 102(b) as being anticipated by Shiozawa et al. (U.S. Patent No. 5,392,303).

Applicants respectfully disagree with the Examiner's contentions and submit the following remarks in response.

The present invention as claimed in claim 17 is directed to an optical signal transmitter comprised of a laser diode for outputting an optical signal to be transmitted and a driving current source for driving the laser diode. A plurality of control circuits each provide a control signal for controlling the optical wavelength of the laser diode in different control modes, where each control circuit generates the control signal based on a mutually different control parameter corresponding to the control mode.

A selector selects one of the control modes according to the status of electrical signals representing external conditions of the laser diode, and applies the control signal output from the selected control circuit to the laser diode driving current source, thereby achieving stabilizing control of optical wavelength with the selected control mode.

Regarding the Examiner's rejection of this claim under 35 U.S.C. § 112,

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Applicants have amended the rejected claims to clarify their scope. In particular, the Examiner asserted that it was unclear how the selector applies the control signal to the laser diode. As amended, claim 17 clearly indicates that the control signal is output from the selected control circuit to the laser diode *driving current source*. Thus, as claimed, and as is clear from the description in at least Fig. 7 of the specification, the selector is connected to the laser diode via a driving current source. Likewise, independent claim 25 maintains similar claim limitations in this respect and is thus clear on the relationship between the elements for the same reasons.

Regarding claim 18, the Examiner has asserted that claim 18 contains a gap between the controller and the laser diode. Applicants have amended the claim to clarify the scope of the claims. In particular, amended claim 18 clearly indicates that the controller is located between the output of the selector and one of the driving circuits so as to control the laser module to reduce deviation.

As such, Applicants respectfully submit that the pending claims are not indefinite and contain elements sufficient to claim the intended subject matter. Furthermore, it is asserted that all amendments to the claims are fully supported in the application as filed, by at least the description contained in Fig. 7 and pages 24-29 of the specification. Therefore, Applicants request that the rejection of claims 17-21 and 25-26 under 35 U.S.C. § 112 be withdrawn.

Regarding the Examiner's projected double patenting rejection of claim 25 in view of claim 17, Applicants have amended claim 25 to include a "control mode decision circuit," not claimed in claim 17. As such, Applicants request that this rejection not be applied to allowable claim 25.

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Regarding the Examiner's rejection of claims 17-23 and 25-28 under 35 U.S.C. § 102, Applicants respectfully submit that these claims are not anticipated by the cited reference Shiozawa.

As discussed above, the present invention is directed to laser module that includes a selector that selects a control mode for the laser based on the external conditions of the laser diode. This is done in order to achieve stabilizing control of the emitted optical wavelength using the selected control mode. In this configuration, a number of control modes each provide a control signal for controlling the optical wavelength of said laser diode, and, depending on certain conditions, a selector uses one of the control modes and applies it to the laser diode.

For example, in this arrangement when a laser module is unstable, the selector may be set to operate on the basis of a constant laser temperature control mode or a constant forward current control mode. Once the laser module is stable the selector can be switched so as to operate the laser diode on a constant wavelength control mode.

The cited prior art, namely Shiozawa, teaches a frequency stabilization method for a semi-conductor laser. In the first embodiment, Shiozawa describes a laser 101 which is stabilized by way of a simultaneously operating current controller 102 and temperature control devices 103 (heat sink), 105 (heat sink controller) and 106 (temperature controller). This arrangement is discussed in detail with respect to Figs 3 and 3A and is described generally in column 6, lines 30-62, and in more detail in columns 7-9. Specifically in column 9, lines 12-20, Shiozawa states:

“As described above, with the light source according to the first embodiment, the current controller 102 controls the driving current for the semiconductor laser 101 so that the output light power of the laser 101 is

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kept constant, *and at the same time*, the temperature controller 106 and the heat sink controller 105 control the reference temperature T.sub.0 of the heat sink 103 so that the temperature change of the active layer 101c is cancelled.” (emphasis added)

Turning to the second embodiment, shown in Fig. 4, and used by the Examiner as the basis of the rejection, a microcomputer 218 simply replaces subtractor 111, temperature controller 106 and subtractor 112. As stated in column 10, lines 3-5, it is stated, “Therefore, in the second embodiment, the same effects as those in the first embodiment can be obtained.” Thus, in this arrangement as well, the laser is always operating in conjunction with at least two parameters simultaneously, current control and temperature control.

It is evident from that the arrangement that Shiozawa is not analogous to the present invention.

For example, there is no teaching or suggestion in Shiozawa that discloses a plurality of control circuits each providing a control signal for controlling the optical wavelength of said laser diode *in different control modes*. Furthermore, there is no teaching or suggestion in Shiozawa that discloses a selector to select *one of said control modes*, and to apply the control signal output from said selected control circuit to said laser diode driving current source, thereby achieving stabilizing control of optical wavelength with said selected control mode.

The laser wavelength control arrangement in Shiozawa does not employ a plurality of separate control modes, nor does it maintain a selector for selecting between modes. Rather, the Shiozawa laser control apparatus uses a single mode utilizing both current and temperature control simultaneously.

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Independent claims 18, 22, 25 and 27 each contain similar aspects of selecting between multiple control modes, and are thus allowable for the same reasons discussed above. Likewise, dependent claims 19-21, 23-24, 26 and 28, that depend from claims 18, 22, 25 and 27 respectively, and are thus allowable for the same reasons.

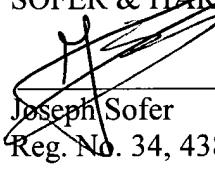
As such, Applicants respectfully request that the rejections of claims 17-28 be withdrawn and submit that the present invention as claimed is now in condition for allowance, the earliest possible notice of which is earnestly solicited. If the Examiner feels that a telephone interview would advance the prosecution of this application he is invited to contact the undersigned at the number listed below.

Respectfully submitted

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